Cardiovasc Surg Int 2024;11(x):108-113
http://dx.doi.org/DOI: 10.5606/e-cvsi.2024.1666
www.e-cvsi.org

Cardiovascular Surgery and Interventions

Original Article Open Access

Link between lower extremity venous reflux and varicocele in adult male patients: A prospective study

Kamil Doğan[1], Ferit Çetinkaya[2], Ayşe Taş[3]

[1]Department of Radiology, Ağrı Training and Research Hospital, Ağrı, Türkiye
[2]Department of Cardiovascular Surgery, Ağrı Training and Research Hospital, Ağrı, Türkiye
[3]Department of Public Health, Adıyaman University, Adıyaman, Türkiye

Received: March 31, 2024 ***Accepted:*** May 01, 2024 ***Published online:*** May 17, 2024

ABSTRACT

Objectives: This study aimed to investigate the relationship between lower extremity venous reflux and varicocele in adult males.

Patients and methods: A total of 102 adult male patients (mean age: 42.7±15.5 years; range, 20 to 82 years) with complaints of burning, cramps, swelling with prolonged standing, and superficial varicose veins were enrolled in the prospective study between January 2023 and June 2023. All patients were subjected to bilateral lower extremity venous and scrotal Doppler ultrasonography.

Results: Varicocele was more frequently observed in individuals with left vena saphena magna (VSM) reflux compared to those without (p=0.001). Similarly, varicocele was more prevalent in individuals with left VSM insufficiency compared to those without (p=0.008). However, there was no significant relationship between right VSM insufficiency, right VSM reflux, and pampiniform reflux on either side (p>0.05).

Conclusion: In patients with reflux in the left VSM, pampiniform reflux and varicocele are more frequently observed. This finding can provide valuable clues for the early diagnosis of varicocele, particularly for urologists, vascular surgeons, and radiologists.

Keywords: Doppler ultrasound, varicocele, venous reflux.

Chronic venous insufficiency is a commonly encountered vascular disorder in the community. Advancing age, obesity, pregnancies, prolonged periods of standing, positive family history, and Caucasian ethnicity are predisposing factors for chronic venous insufficiency.[1] Previous studies have proposed that chronic venous insufficiency shares similar pathogenesis with varicocele in males, emphasizing venous valve insufficiency, associated reflux, venous wall pathology, and May-Thurner syndrome as frequently suggested pathologies.[2-5]

Varicocele, observed in approximately 15% of the adult male population, has been identified as a major cause of infertility, affecting nearly 40% due to a decrease in sperm count and motility.[6] Diagnosis involves the palpation of dilated veins during physical examination or the demonstration of enlarged pampiniform veins through Doppler ultrasonography (USG), both playing a significant role.

This study aimed to investigate the potential connection between lower extremity venous reflux and varicocele in adult males.

PATIENTS AND METHODS

A total of 102 adult male patients (mean age: 42.7±15.5 years; range, 20 to 82 years) presenting with burning, cramps, swelling with prolonged standing, and superficial varicose veins at the cardiovascular surgery outpatient clinic of the Ağrı Training and Research Hospital between January 2023 and June 2023

Corresponding author: Ferit Çetinkaya, MD. Ağrı Eğitim ve Araştırma Hastanesi, Kalp ve Damar Cerrahisi Kliniği, 04200 Ağrı, Türkiye
E-mail: cetinkaya1234@gmail.com

Citation:
Doğan K, Çetinkaya F, Taş A. Link between lower extremity venous reflux and varicocele in adult male patients: A prospective study. Cardiovasc Surg Int 2024;11(x):108-113. doi: 10.5606/e-cvsi.2024.1666.

were enrolled in the prospective study. Patients with a history of venous thrombosis were excluded from the study (Figure 1).

After obtaining a medical history and conducting a physical examination, all patients were subjected to bilateral lower extremity venous and scrotal Doppler USG. A single radiologist performed measurements using a Toshiba Aplio 500 Ultrasound device (Canon Medical Systems USA, Inc., Tustin, CA, USA) during the same session (Figure 2). Measurements included diameter and reflux measurements of the vena saphena magna (VSM) at the junction level, as well as diameter and reflux measurements of bilateral pampiniform veins. The VSM reflux and pampiniform reflux were measured with the Valsalva maneuver. Standing measurements were taken for all patients. Reflux lasting more than 1 sec at the VSM junction level was considered positive.[7] Reflux flow lasting more than 1 sec along the course of the VSM at the thigh level following caudal decompression was considered VSM venous insufficiency. In scrotal Doppler USG, patients with a diameter of 3 mm or more on either side and reflux lasting more than 2 sec in the pampiniform plexus vein were considered to have varicocele, according to the 2019 guidelines published by the European Society of Urogenital Radiology Scrotal and Penile Imaging Working Group.[8]

Statistical analyses

The data obtained from the study were analyzed using the IBM SPSS version 19.0 software (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was performed to assess normal distribution suitability. Descriptive statistics, including numbers and percentages, means, and standard deviations, were provided. The Mann-Whitney U test was employed to evaluate the relationship between two groups for measurement data that did not follow a normal distribution. The chi-square test was utilized to assess the relationship between categorical variables. A p-value <0.05 was considered statistically significant.

RESULTS

The sociodemographic characteristics and medical histories of the patients are presented in Table 1. In terms of occupation, 37.3% were workers, 16.7% were farmers, and 12.7% were retirees. Among the patients, 57.8% smoked, and 2.0% consumed alcohol. Additionally, 2.9% had diabetes mellitus (DM), 11.8% had hypertension (HT), and 1.9% had benign prostatic hyperplasia (BPH).

None of the patients exhibited venous ulcers or infertility. Scrotal pain was reported in 13.7% of the patients. Additionally, among the patients, 34.3% presented with right VSM insufficiency, 30.4% with right VSM reflux, 46.1% with left VSM insufficiency, 42.2% with left VSM reflux, and 26.5% with pampiniform reflux. Varicocele was observed in 34.3% of the patients. The mean diameter of the right VSM was 5.2±2.2, the mean diameter of the left VSM was

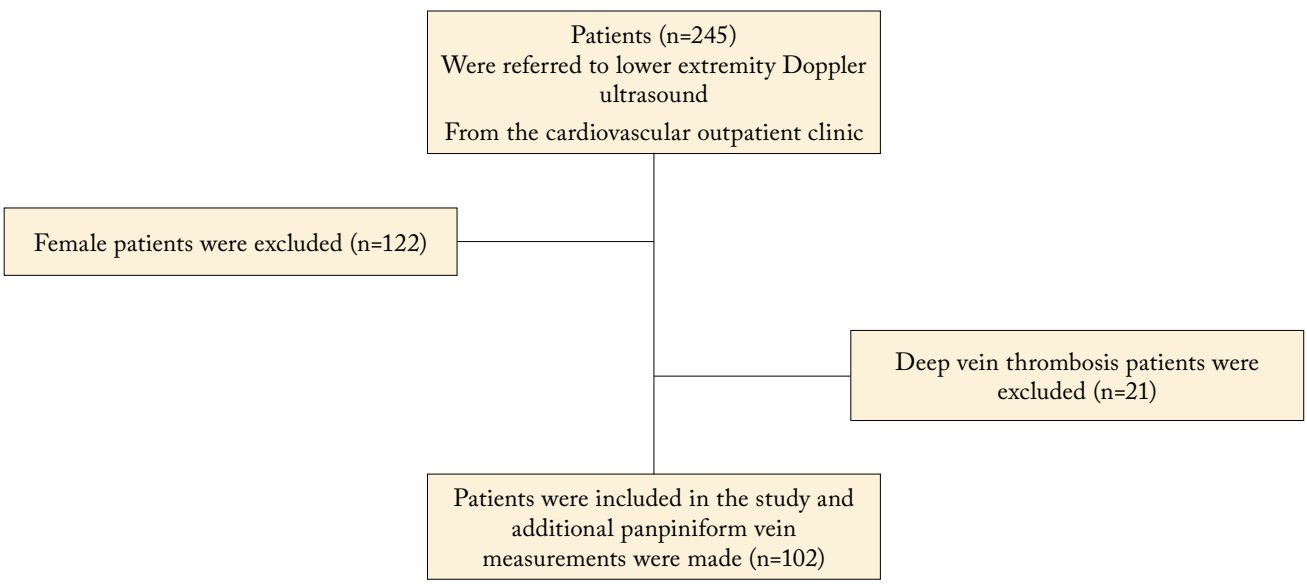

Figure 1. Flowchart of the study.

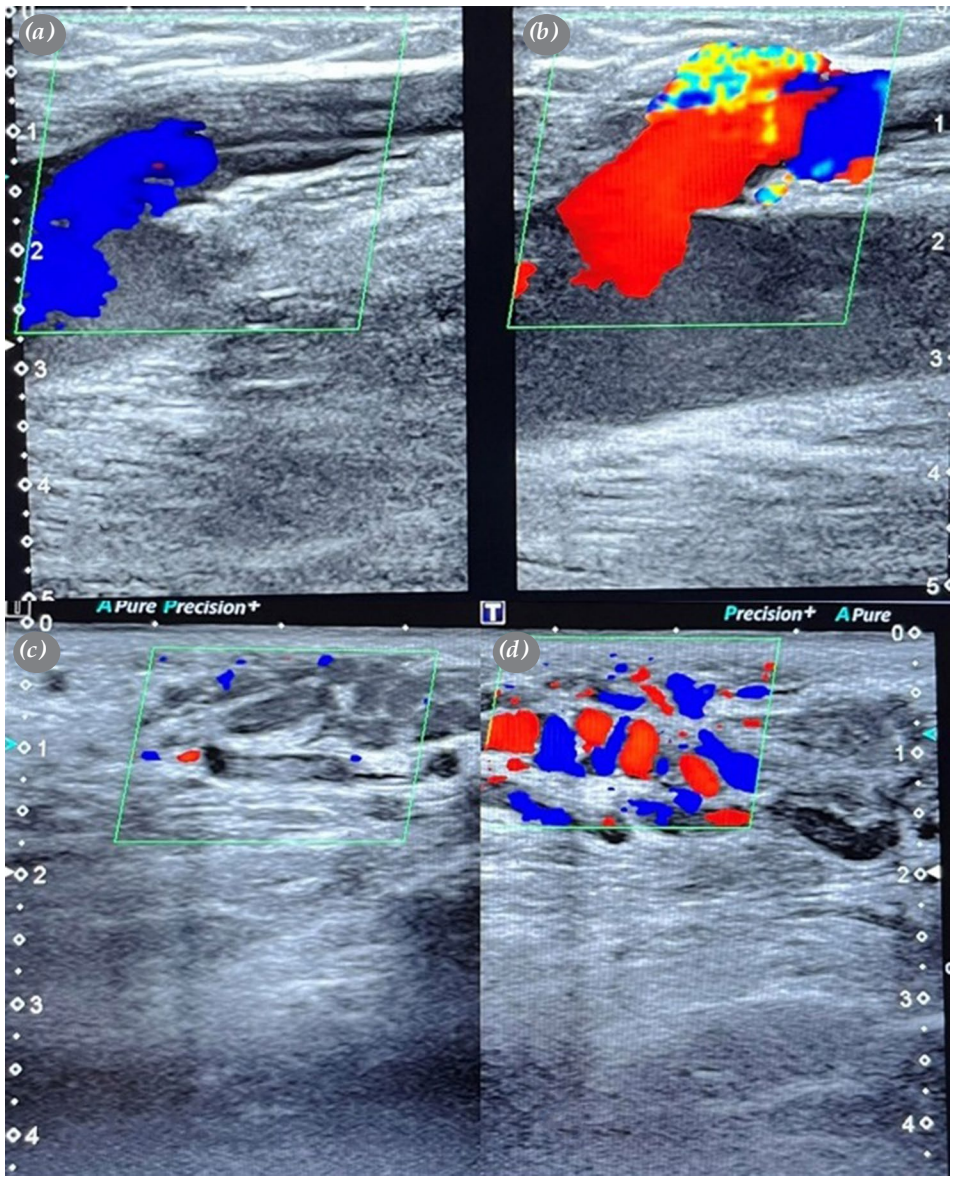

Figure 2. **(a)** Doppler USG of the same patient at the dilated VSM junctional level, **(b)** reflux at the VSM junctional level after the Valsalva maneuver, **(c)** dilated pampiniform veins, **(d)** reflux flow of the pampiniform veins after the Valsalva maneuver.
USG: Doppler ultrasonography; VSM: Vena saphena magna.

5.8±2.6, the maximum VSM diameter was 6.4±2.7, and the mean diameter of the pampiniform vein was 1.3±1.8 (Table 2).

Pampiniform reflux was more prevalent in those with left VSM reflux compared to those without (p=0.001). Similarly, individuals with left VSM insufficiency exhibited a higher occurrence of pampiniform reflux than those without (p=0.006). However, there was no significant relationship between right VSM insufficiency, right VSM reflux, and pampiniform reflux (p>0.05), as indicated in Table 3.

Varicocele was more frequently observed in individuals with left VSM reflux compared to those without (p=0.001). Similarly, varicocele was more prevalent in individuals with left VSM insufficiency compared to those without (p=0.008). However, there was no significant relationship between right VSM insufficiency, right VSM reflux, and

Table 1
Sociodemographic characteristics and medical histories of the patients

	n	%	Mean±SD
Age (year)			42.7±15.5
Job			
Laborer	38	37.3	
Officer	7	6.9	
Farmer	17	16.7	
Retire	13	12.7	
Soldier	9	8.8	
Police	4	3.9	
Security	4	3.9	
Health personnel	2	2.0	
Small business	4	3.9	
Other	4	3.9	
Smoker	59	57.8	
Diabetes mellitus	3	2.9	
Hypertension	12	11.8	
Benign prostatic hyperplasia	2	1.9	

SD: Standard deviation.

pampiniform reflux on either side (p>0.05), as outlined in Table 4.

No significant relationships were found between the presence of pampiniform reflux and age, alcohol use, diagnosis of DM, diagnosis of HT, and diagnosis of BPH (p>0.05). Pampiniform reflux was more frequently observed in nonsmokers compared to smokers (p=0.005). Additionally, pampiniform reflux was more prevalent in individuals with scrotal pain compared to those without (p<0.001).

Similarly, no significant relationships were detected between the presence of varicocele and age, alcohol use, and HT diagnosis (p>0.05). However, individuals diagnosed with BPH exhibited a higher prevalence of varicocele compared to those without (p=0.01). Varicocele was also more frequently observed in individuals with DM diagnosis compared to those without (p=0.04). Furthermore, individuals with scrotal pain had a higher prevalence of varicocele compared to those without (p<0.001).

Table 2
Clinical findings of the patients

	n	%	Mean±SD
Right VSM diameter (mm)			5.2±2.2
Left VSM diameter (mm)			5.8±2.6
Pampiniform vein diameter (mm)			1.3±1.8
Right VSM insufficiency	35	34.3	
Left VSM insufficiency	47	46.1	
Right VSM reflux	31	30.4	
Left VSM reflux	43	42.2	
Pampiniform vein reflux (right or left)	27	26.5	
Varicocele	35	34.3	
Scrotal pain	14	13.7	

SD: Standard deviation; VSM: Vena saphena magna.

Table 3
Relationships between pampiniform reflux, VSM reflux, and VSM insufficiency

	Pampiniform reflux (on any side)					
	Absent		Present			
	n	%	n	%	χ^2	*p*
Left VSM reflux	24	55.8	19	44.2	10.46	**0.001**
Right VSM reflux	22	71.0	9	29.0	0.02	0.89
Left VSM insufficiency	28	59.6	19	40.4	7.44	**0.006**
Right VSM insufficiency	26	74.3	9	25.7	0.0	1.00

VSM: Vena saphena magna.

Table 4
Relationships between varicocele and reflux and insufficiency

	Varicocele					
	Absent		Present			
	n	%	n	%	χ^2	p
Left VSM reflux	20	46.5	23	53.5	10.70	**0.001**
Right VSM reflux	20	64.5	11	35.5	0.00	1.00
Left VSM insufficiency	24	51.1	23	48.9	7.11	**0.008**
Right VSM insufficiency	24	68.6	11	31.4	0.05	0.82

VSM: Vena saphena magna.

DISCUSSION

In our study, left pampiniform reflux was found to be statistically significantly higher in patients with left VSM reflux. This could be attributed to anatomical reasons, such as the left testicular vein taking a 90° angle with the renal vein and the cross-adjacency of the left iliac vein and the right iliac artery.[9] Chin et al.,[10] in their research involving 21 varicocele patients, were the first to demonstrate that May-Thurner syndrome (compression of the left iliac vein) causes varicocele. Furthermore, a case report has demonstrated that May-Thurner syndrome could lead to varicocele by causing left internal iliac vein reflux.[11] Although our study suggests a significant association between varicocele and left venous reflux, the exact cause may be related to this condition. However, this study did not specifically investigate the presence of reflux in the internal iliac veins.

Another theory discussed in many previous studies regarding the relationship between venous reflux and varicocele is venous valve insufficiency as a shared etiology.[3,12,13] However, in our study, a statistically significant increase in varicocele was observed only in patients with venous reflux in the left VSM.

The relationship between varicocele and demographic data was investigated in our study, but no significant association was found. It is not surprising that varicocele is more prevalent in patients with scrotal pain complaints. In a study conducted by Owen et al.,[14] it was reported that scrotal pain accompanied varicocele in 10% of patients. On the other hand, none of the patients included in the study showed evidence of venous ulcers upon examination.

According to the report on varicocele and infertility published by the American Urological Association, even if patients diagnosed with varicocele do not complain of infertility, it is emphasized that sperm analysis should be performed. This is because patients may express a desire to have children in the future, and those with developed azoospermia should be treated.[15] Although none of the patients included in this study reported infertility complaints, all patients diagnosed with varicocele were referred to urology specialists for a thorough examination and sperm analysis, as they are considered potential candidates for secondary infertility. Additionally, patients with detected VSM reflux and dilation were treated with stripping, radiofrequency ablation, or medical follow-up (compression stockings and venoactive drugs).[16]

There are some limitations to this study. This study was planned with prospectively conducted Doppler measurements during the same session; however, sperm analysis and measurements of internal iliac vein reflux were not performed due to technical challenges. Additionally, the relatively low number of patients might limit the generalizability of the results, and conducting studies with larger sample sizes could yield more comprehensive outcomes.

In conclusion, in patients with reflux in the left VSM, pampiniform reflux and varicocele are more frequently observed on either side. This finding can provide a valuable clue for the early diagnosis of varicocele, particularly for urologists, vascular surgeons, and radiologists. Further extensive studies with a larger number of patients are needed in this regard.

Ethics Committee Approval: The study protocol was approved by the Ankara City Hospital Ethics Committee (date: 21.06.2023, no: 3577). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from each patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, design, control/supervision, writing the article, critical review: F.Ç.; Data collection and/or processing, references and fundings, materials: K. D.; Analysis and/or interpretation, literature review: A.T.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Salim S, Machin M, Patterson BO, Onida S, Davies AH. Global epidemiology of chronic venous disease: A systematic review with pooled prevalence analysis. Ann Surg 2021;274:971-6. doi: 10.1097/SLA.0000000000004631.
2. Yetkin E, Ozturk S, Cuglan B, Turhan H. Symptoms in dilating venous disease. Curr Cardiol Rev 2020;16:164-72. doi: 10.2174/1573403X16666200312101245.
3. Bolcal C, Sargin M, Mataraci I, Iyem H, Doganci S, Kilic S, et al. Concomitance of varicoceles and chronic venous insufficiency in young males. Phlebology. 2006;21(2):65-9.
4. de Kretser DM. Male infertility. Lancet 1997;349:787-90. doi: 10.1016/s0140-6736(96)08341-9.
5. Pryor JL, Kent-First M, Muallem A, Van Bergen AH, Nolten WE, Meisner L, et al. Microdeletions in the Y chromosome of infertile men. N Engl J Med 1997;336:534-9. doi: 10.1056/NEJM199702203360802.
6. Nagler HM. Varicocele. In: Lipshultz LI, Howards SS, Niederberger CS, editors. Infertility in the Male. Cambridge: Cambridge University Press; 2009. p. 331-61.
7. Labropoulos N, Tiongson J, Pryor L, Tassiopoulos AK, Kang SS, Ashraf Mansour M, et al. Definition of venous reflux in lower-extremity veins. J Vasc Surg 2003;38:793-8. doi: 10.1016/s0741-5214(03)00424-5.
8. Freeman S, Bertolotto M, Richenberg J, Belfield J, Dogra V, Huang DY, et al. Ultrasound evaluation of varicoceles: Guidelines and recommendations of the European Society of Urogenital Radiology Scrotal and Penile Imaging Working Group (ESUR-SPIWG) for detection, classification, and grading. Eur Radiol 2020;30:11-25. doi: 10.1007/s00330-019-06280-y.
9. Bomalaski MD, Mills JL, Argueso LR, Fujitani RM, Sago AL, Joseph AE. Iliac vein compression syndrome: An unusual cause of varicocele. J Vasc Surg 1993;18:1064-8. doi: 10.1067/mva.1993.45525.
10. Chin P, Villalba L, Huang S, Osei-Tutu L. MP46-14 Varicocele and may-thurner syndrome: The etiological link. The Journal of Urology 2019;201(Supplement 4):e683-e.
11. Stern JR, Patel VI, Cafasso DE, Gentile NB, Meltzer AJ. Left-sided varicocele as a rare presentation of May-Thurner syndrome. Ann Vasc Surg 2017;42:305.e13-305.e16. doi: 10.1016/j.avsg.2016.12.001.
12. Koyuncu H, Ergenoglu M, Yencilek F, Gulcan N, Tasdelen N, Yencilek E, et al. The evaluation of saphenofemoral insufficiency in primary adult varicocele. J Androl 2011;32:151-4. doi: 10.2164/jandrol.109.009258.
13. Yilmaz S, Aksoy E, Yaylaci S. Evaluation of the relationship between lower e.remity varicose veins-venous insufficiency and varicocele-vulvar varicose veins in our population. Turk J Vasc Surg 2013;22:297-302.
14. Owen RC, McCormick BJ, Figler BD, Coward RM. A review of varicocele repair for pain. Transl Androl Urol 2017;6(Suppl 1):S20-9. doi: 10.21037/tau.2017.03.36.
15. Male Infertility Best Practice Policy Committee of the American Urological Association; Practice Committee of the American Society for Reproductive Medicine. Report on varicocele and infertility. Fertil Steril 2004;82 Suppl 1:S142-5. doi: 10.1016/j.fertnstert.2004.05.057.
16. Topcu AC, Ocal A. Radiofrequency ablation versus high ligation and stripping for the treatment of symptomatic great saphenous vein insufficiency: Shortterm patient-reported outcomes. Cardiovasc Surg Int 2023;10:41-8. doi: 10.5606/e-cvsi.2023.1490.